No. 672,309. Patented Apr. 16, 1901.

F. H. BROWN.

PROCESS OF LOCATING METALLIC MINERALS.

(Application filed Sept. 19, 1900.)

(No Model.) 2 Sheets—Sheet 1.

Fig. I.

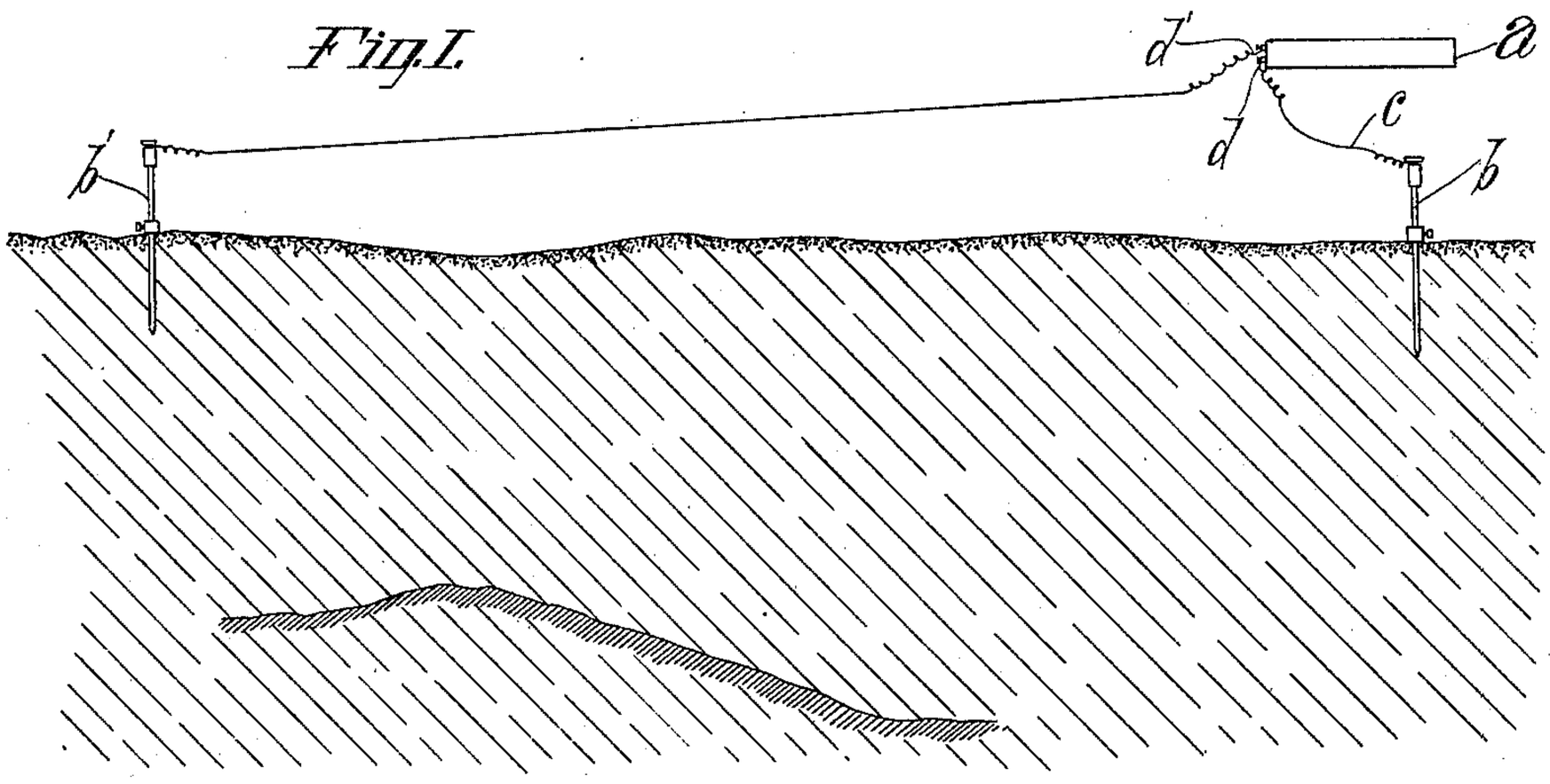


Fig. II.

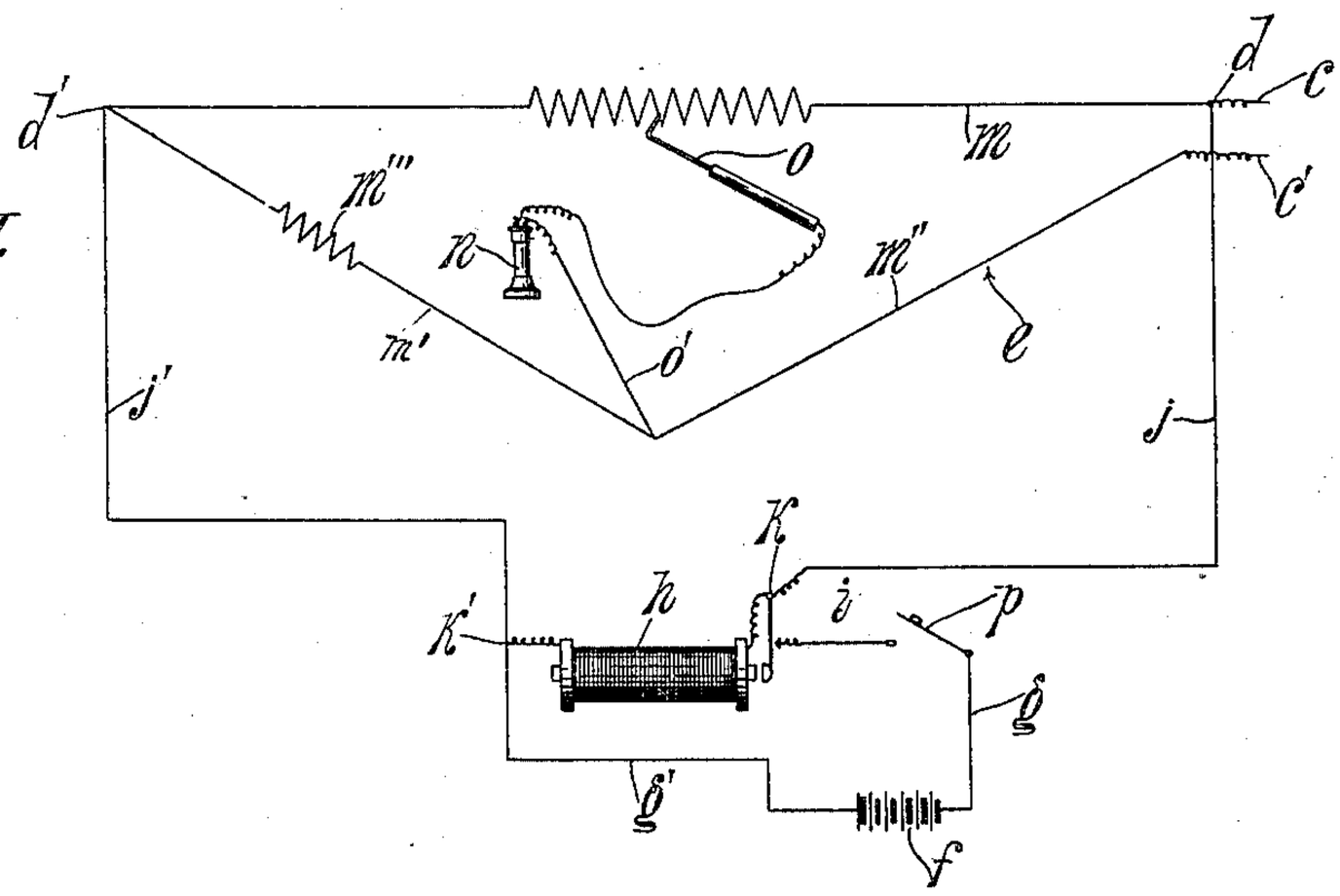
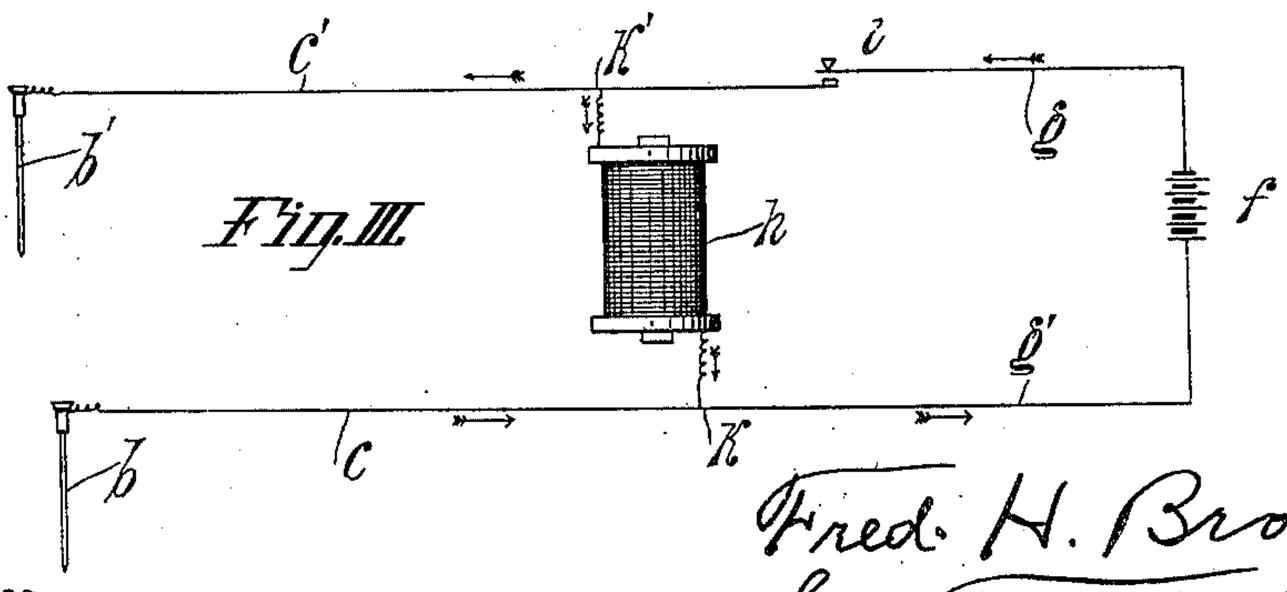


Fig. III.



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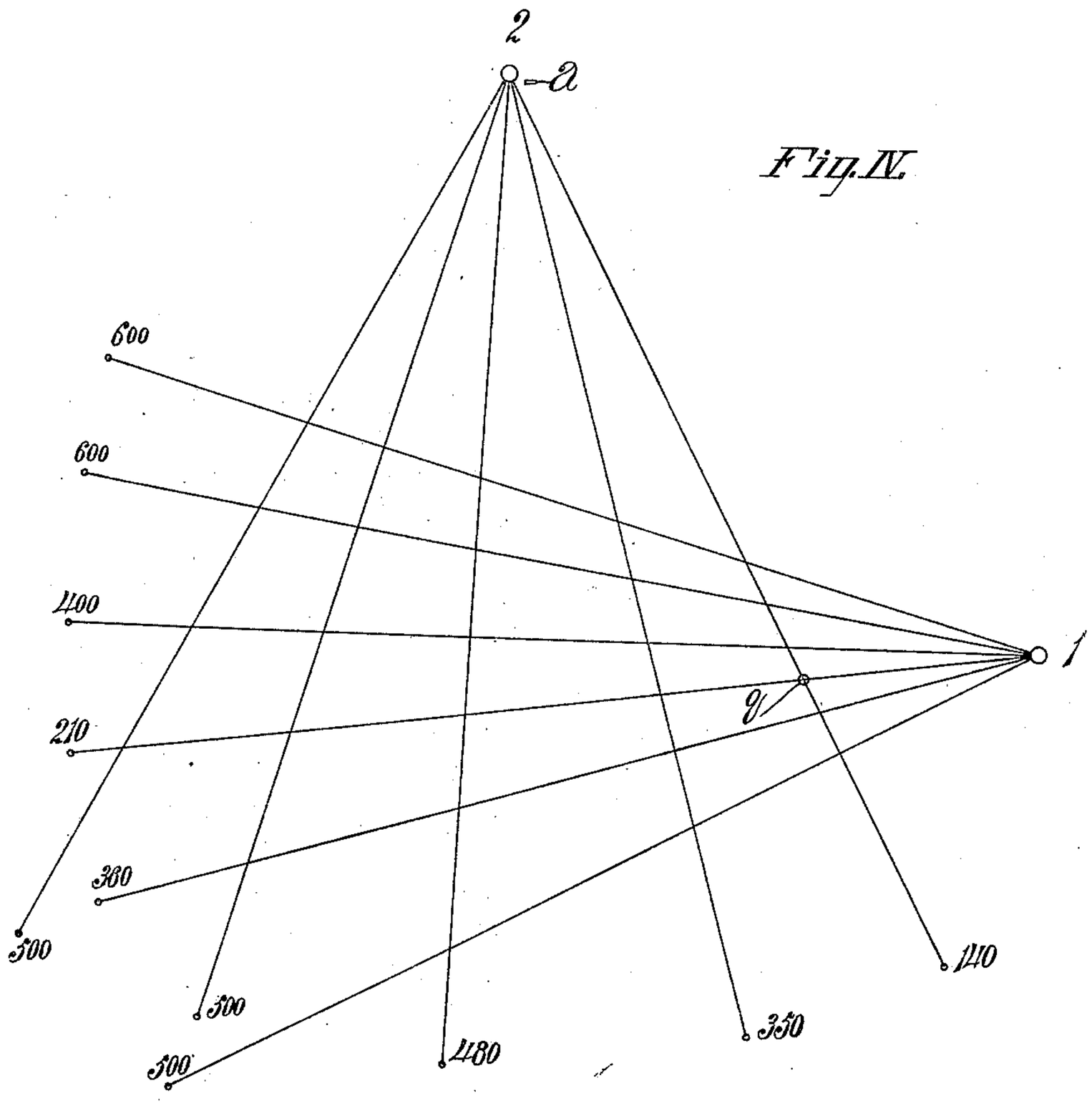

Fig. IV.

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UNITED STATES PATENT OFFICE.

FRED HARVEY BROWN, OF LOS ANGELES, CALIFORNIA.

PROCESS OF LOCATING METALLIC MINERALS.

SPECIFICATION forming part of Letters Patent No. 672,309, dated April 16, 1901.

Application filed September 19, 1900. Serial No. 30,522. (No specimens.)

To all whom it may concern:

Be it known that I, FRED HARVEY BROWN, a citizen of the United States, residing at Los Angeles, in the county of Los Angeles and State of California, have invented and discovered a new and useful Process of Locating Metallic Minerals or Buried Treasure, of which the following is a specification.

This invention consists in locating metals or other good electric conductors beneath the surface of the earth by a signal caused by direct extra electrical impulses generated by an electromagnet.

Numerous difficulties are encountered in accomplishing the accurate measurement of the conductivity of the earth. One of these difficulties arises from electrolysis, which is liable to occur in greater or less measure, depending upon the various conditions encountered in the practice of this art. The inaccuracies arising from electrolysis have been overcome in a large degree by the use of an alternating current; but prior to my present invention and discovery I have found great trouble at noon during extra-hot days, when the potentials of the earth and air were very high. Under such conditions it was almost impossible to establish an absolute point of silence in the telephone-receiver used. In such cases I have found that no point of silence was actually reached or shown, but that in order to determine the point of balance of the bridge I had to move or vibrate the stylus to one side or the other of the point of lowest volume of sound. By so moving the stylus to the right and left over the point of lowest volume of sound I was enabled to approximate only this point where silence should be. This was done by noting with the ear the volume of sound when the stylus was a certain distance from the supposed point toward the right and noting such point by the eye, then moving the stylus to the left of the supposed point until the volume of sound was about the same as the volume of sound noted on the right, and then with the eye fixing a point midway between these two places, right and left, as the point where silence should have ensued. This required considerable time, care, and skill, and the results did not reach the desired degree of accuracy.

An object of my present invention is to eliminate these difficulties and to thereby attain a higher degree of accuracy.

Another object is to dispense with the necessity of using an alternating current and to provide a process for locating minerals which is simpler and more easily understood and more readily practiced by the operator, and which can be carried out with simpler appliances than can any former process.

In carrying out my new process, which avoids electrolysis without employing an alternating current, a form of construction can be used which is very much more simple than heretofore necessary, there being fewer parts and contacts in the devices than were required in the devices necessary for the previous alternating-current process, and I find that the volume of sound emitted in the receiver is very much more uniform, regardless of the resistance of the earth's circuit being measured. In the previous process, using an alternating current, in practice I find that when the resistance of the earth being measured is quite low the rheotome on the primary stutters on its contact and in some cases refuses to vibrate, which then requires a readjustment of the vibrator. In other words, in such cases the volume of tone emitted by the receiver varies according as the earth's resistance being measured is either high or low. In this new process the sound is very much more uniform and equal, and the point of silence is more clearly indicated and apparent to the ear, the point of balance on the bridge being entirely silent in this new process, wherein I use a direct extra current, as will be hereinafter fully set forth.

An object of my present invention is to avoid the use of alternating currents and the necessary complexity of mechanisms for producing the same and causing the signals to be more uniform in volume and simplify the general application of the process.

I have discovered that by successively causing direct extra electrical impulses to traverse successive different definite lengths of earth forming part of a circuit superimposed upon an electrically-energized closed circuit and measuring the resistance thereof and repeating the measurements and comparing the resistances the difficulties above set forth as

being heretofore encountered are eliminated and the desirable objects above stated are attained.

I will now describe my new process, reference being had to the accompanying drawings, in which—

Figure I represents the application of my process in practice. The electrodes and other apparatus are exaggerated as compared with the portion of earth shown. Fig. II is a diagrammatic view of the various parts and their connections of apparatus suitable for carrying out my new process. Fig. III is a diagrammatic view showing how the direct extra current is generated and sent into the earth. This is without reference to the Wheatstone bridge, which forms part of the apparatus for carrying out the process. Fig. IV is a graphic representation illustrating measurements made in carrying out my newly-invented process.

Referring to Figs. I and IV, the apparatus a will be stationed at some convenient point—as, for instance, at the station marked 1 in Fig. IV. Then a suitable electrode or conducting-rod b, preferably of brass, is driven into the earth to form an electrical contact therewith. In case the earth is hard and dry it is to be moistened by pouring water around the rod, thus insuring a good contact. The rod b is connected by wire c to one of the X binding-posts d of the Wheatstone bridge e, forming part of the instrument a. The operator will then take a similar conducting-rod b', which is connected with the other X binding-post d' of the Wheatstone bridge, and will insert said rod b' in the earth at a definite distance from the other rod b. f in Fig. II indicates a galvanic battery connected by and in series with the wires g g' and the windings of an electromagnet h. The circuit g is adapted to be broken by the rheotome i. The wires j j' are superimposed upon the circuit-wires g and g' at the points k k', the other ends of the wires j j' being connected with the diamond-points of the bridge at the points d d'. m indicates a high-resistance wire calibrated from the point d to the point d'. m''' indicates a resistance placed in one arm m' of the bridge, the receiver n forming, with the stylus o, a part of the bridge-circuit, which is connected by wire o', the end of the stylus being adapted to contact with the high-resistance wire m in the ordinary way. When the contacts have been made through the electrodes b b', as shown in Fig. I, then the operator will close the circuit by moving the switch p in Fig. II. The battery f then sends the current through the windings of the electromagnet h and through the wires g and g', thus magnetizing the core of the electromagnet h and causing the rheotome i to vibrate, thus interrupting the continuity of the current in the circuit g g'. These interruptions cause what is termed a "direct extra current" to be thrown off from the convolutions or helix of the electromagnet h when the circuits g and g' are open. Said direct extra current consists in impulses which are continuous in direction and are successively thrown off in harmony with the vibrations of the break-piece i. Said impulses pass through the then only closed circuit there is for them to traverse, which means the circuit through j j', through c into the earth and out of the earth at b', and through the wire c' to the bridge at d', through the arms m m' m'' of the bridge in the manner common in Wheatstone bridges. The operator then, with the telephone-receiver n at his ear, will move the point of the stylus o along the calibrated wire m until the point of silence is reached. By this method the tone produced in the receiver n is clear and pronounced to the point of silence, diminishing as it approaches the point of silence from either side and increasing in volume as the point of silence is departed from. An absolute point of silence will occur at the point of balance of the bridge.

My present invention also relates to a method of determining the most desirable point at which to locate a shaft for mining the ore.

Another measure of great economy in this new process is as follows: After having found a low measurement which would indicate ore provision is now made by which a certain point on the low line can be picked out or designated which will tell the operator where to place a drill or sink a shaft on the low line of measurement. By this new process I am enabled to designate the point on the line of low measurement where it would be most economical to place the drill or sink a shaft. This will be exemplified by reference to Fig. IV. The instrument a is first stationed at 1, and measurements are taken showing-resistances 600, 650, 400, 210, 360, and 500. These resistances would indicate that there was metal between the station 1 and the point where the rod was inserted in the earth at 210. These distances between the station and the end of the rod might be, say, five hundred feet each. Now although the operator has thus secured a low, as indicated by the line 210, it would yet be impossible for him to tell the point on this five-hundred-foot line where it would be best to sink a shaft. The next step in this new process is as follows: The instrument is moved to the station marked 2, and lines of measurement are run across the previous line of low resistance 210, as shown by lines 500, 500, 480, 350, and 140 in Fig. IV. By this cross-measuring, as shown in Fig. IV, the exact point q where the two lows 140 and 210 cross is the point at which to place a drill or sink a shaft. The operator is thus enabled by this new process of cross-measurements to save the expense of any experimental drilling and digging along the line of low resistance.

It is obvious that the process and mode of operation above set forth may be carried out in a wide variety of forms and arrangements

of specific apparatus, and I desire it to be understood that my invention is not to be limited to the form or arrangement of apparatus employed.

What I claim, and desire to secure by Letters Patent of the United States, is—

1. The process of locating metallic or other conducting substances in the earth which consists in successively causing direct extra electrical impulses to traverse successive different definite lengths of earth forming part of a circuit superimposed upon an electrically-energized closed circuit; measuring the resistance thereof, then repeating the measurements, and finally comparing the resistances.

2. The process of locating metallic or other conducting substances in the earth which consists in successively causing direct extra electrical impulses to traverse successive different definite lengths of earth forming part of a circuit superimposed upon an electrically-energized closed circuit; measuring the resistance thereof, then repeating the measurements, and finally comparing the resistances; then repeating said measurements, varying the distances of earth through which these direct extra electrical impulses are sent.

3. The process of locating metallic or other conducting substances in the earth which consists in first determining, and then comparing the resistances opposed to the passage of successive direct extra electrical impulses sent through different successive distances of earth; said successive lengths of earth respectively forming part of a circuit superimposed upon a closed electrically-energized primary circuit in which the current is interrupted.

4. The process of locating metallic or other conducting substances in the earth which consists in first determining and then comparing resistances opposed to the passage of successive direct extra electrical impulses sent through different successive distances of earth, said successive lengths of earth respectively forming part of a circuit superimposed upon a closed electrically-energized primary circuit in which the current is interrupted; then varying the distances of earth through which these direct extra electrical impulses are successively sent; and determining and comparing the resistances of said lengths of earth respectively.

5. The process of locating metallic or other conducting substances in the earth which consists in establishing a closed electric circuit and an electric circuit superimposed thereon formed in part of a definite length of earth; setting up a continuous electric current in said closed circuit; interrupting the continuity of said current, thereby generating in the superimposed circuit, direct extra electrical impulses; determining the resistance of the earth in the superimposed circuit; repeating the measurements with the same definite length of earth along different lines in the same locality, and finally comparing the measurements thus obtained.

6. The process of locating metallic or other conducting substances in the earth, which consists in establishing a closed electric circuit and an electric circuit superimposed thereon and inclosing a length of earth; setting up a continuous electric current in said closed circuit; interrupting the continuity of said current and thereby generating in the superimposed circuit direct extra electrical impulses; successively inclosing in the superimposed circuit, while under the influence of the interrupted current of the closed circuit, various definite lengths of the earth in a given locality, and determining the resistances of such successively-inclosed lengths of the earth; and finally comparing said resistances, substantially as and for the purpose set forth.

7. The process of locating metallic or other conducting substances in the earth which consists in successively causing direct extra electrical impulses to traverse successive different definite lengths of earth forming part of a circuit superimposed upon an electrically-energized closed circuit; measuring the resistance thereof, then repeating the measurements, then comparing the resistances, and then in a like manner cross-measuring the line of low found by the previous measurements, thus determining the lowest point on the previous line of low.

In testimony whereof I have signed my name to this specification, in the presence of two subscribing witnesses, at Los Angeles, California, this 8th day of September, 1900.

FRED HARVEY BROWN.

Witnesses:

JAMES R. TOWNSEND,

JULIA TOWNSEND.